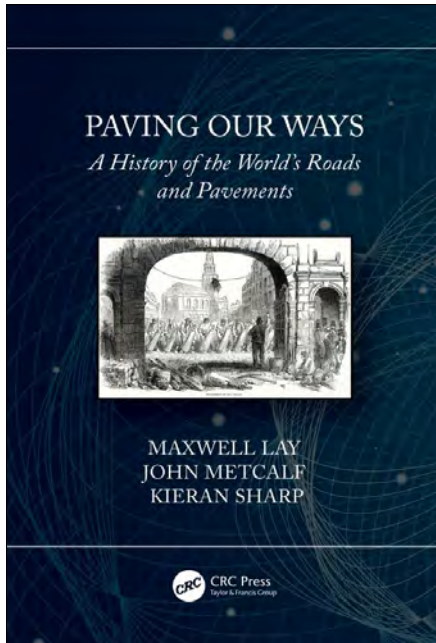


PAVING OUR WAYS

A History of the World's Roads and Pavements

A book by Maxwell Lay, John Metcalf and Kieran Sharp, published by CRC Press.

A Review by Keith Baker.



Having reviewed Max Lay's eBook on 19th century transport, *With Power & Purpose*¹, for Engineering Heritage Australia Magazine in October 2016, I was asked by the editor to review the recent book on road pavements for which Max Lay was lead author. For an electrical engineer, the thought of digesting 22 chapters on roads was somewhat daunting, but having worked most of my engineering career in multi-discipline teams which included civil engineers covering construction and maintenance of roads, hardstand and airfield pavements, most of the terminology was familiar to me, if not the full technical understanding. So I accepted the challenge.

I found much of interest from a heritage perspective in the changing technology across the world from China and Mesopotamia, Europe, Britain, Australia and North America, stretching from biblical times to the present day. A striking aspect was the far from linear progression from the highly developed Roman roads to the impassable mud and slush of mediaeval English tracks, and the geographic, political and economic factors which either hindered or advanced the development of appropriate pavement technologies. Key issues were the availability of suitable materials and the variability of natural ground surfaces to be crossed. A less obvious factor was

the lack of national ownership and funding of roads, as they benefited the travellers who passed by but not necessarily the landowners or the labourers pressed to maintain them.

Until after the industrial revolution and apart from times of war, there was little interest from governments in funding roads beyond their immediate area of concern, and no national imperative. The Romans had the ability and motivation to build permanent roads as they extended their empire, but after their demise the technology and economic imperative was lost. Meanwhile horse drawn vehicles with narrow iron rimmed wheels turned the alternative dirt tracks to mud or ruts which seriously impeded the transport of people and goods. The disdain the general population had for roads in towns was shown by the widespread custom of throwing household rubbish from windows onto the street, while the lack of laws covering roads meant gravel or soil could be removed with impunity.

From a technical perspective, the book traces world progress in pavement development with numerous references to sources and cross referencing between chapters, and provides two tutorial chapters for non-engineers on basic concepts and materials. For example it describes the difference between gravel containing rounded stones and the sharp edges of crushed stone which allowed compaction, and the difference between tar, asphalt and bitumen and their use in 20th century roads.

Beginning with the importance of a sound base course which needed to be kept as dry as possible by proper contouring and drainage, the book describes different approaches by engineers such as Telford, using a base of large stones arranged flat or on edge, through to concrete, wood or well graded compacted crushed rock championed by McAdam, that continues to the present day. The wearing surface above the base course then served a dual purpose of waterproofing the base course and providing a suitable surface for wheeled vehicles and in earlier times the horses that pulled them.



Laying wood block paving on San Pietrini, Rome, c1910.

Photo courtesy Prof. Enrico Menduni.

¹ Subsequently published in hard cover as *The Harnessing of Power*, by Cambridge Scholars Publishing.

PAVING OUR WAYS – A Review by Keith Baker.

This was achieved with a layer of finer sharp rock compacted into the surface of the base course with the finest particles filling the gaps. This surface was capable of maintenance by adding more fine crushed stone to fill and compact the surface. Other techniques are also described which proved to be more expensive and less generally applicable, such as individually placed cobblestones, wood blocks, geometrically arranged stone setts, stone slabs and even cast iron square blocks.

An interesting factor in the change from unsealed Macadam to covering with a bitumen seal in the 20th Century was the advent of rubber tyres on higher speed motorised vehicles, which raised objectionable dust.



Stone setts on the Champs Elysees, Paris – photo by the authors.

The end chapters of the book concentrate on more recent design techniques and quality assurance, introducing both stress analysis and empirical design supported by international best practice. Design aspects discussed include not only the economic balance between capital cost, durability and maintenance of road pavements, but also the safety and traction on corners and the comfort of motorists related to the roughness of the road surface at a micro and macro level.

The book should provide a comprehensive reference for civil engineering students and practising engineers, and will be interesting from a history and heritage perspective for more general readers of the EHA Magazine.

Connections

Introduction to Heritage Engineering - new at Canberra University.



The University of Canberra is hosting the new course, created by Engineering Heritage Australia, and titled *Introduction to Heritage Engineering*. See something about the course at: <https://www.canberra.edu.au/ucpro/courses/introduction-to-heritage-engineering>
This course will provide engineers and other professionals with an introduction to the skills to assess significance and understand the conservation needs of engineering and industrial heritage sites and items.

We had very short notice, because the course started on the 18th of May and enrolments closed on 17th May. However, it is assumed that the course will be an ongoing thing, so if you are interested, keep your ear to the ground for the next course.

The Archaeology of Craft and Industry and The Romance of Iron and Steel.

A couple of items from *LA on the Web* in a recent issue of the SIA Newsletter caught my attention. *The Archaeology of Craft and Industry*, is a webpage from the University of Illinois Urbana at: faculty.las.illinois.edu/cfennell/IndustrialArchaeologyBook.html
From SIA: *This web page provides an extensive bibliography and list of internet resources related to industrial archaeology, based on a forthcoming book of the same title by Christopher Fennell.* And:

“The Romance of Iron and Steel” (digital.hagley.org/FILM_2018201_FC09). *The earliest print of a film in the Hagley collection. Produced in 1938 and sponsored by the American Rolling Mill Co. (ARMCO), the film explains the science and process of making rolled steel. The film opens with an overview of the ARMCO Research Lab and then follows the manufacturing process through the company’s production facility. Likely shot on location at ARMCO in Middletown, Ohio.*



Do You Love Me? from Boston Dynamics

And here is a bit of fun to finish up – compliments of my daughter Jessie, who is always a great source of web novelties: <https://www.youtube.com/watch?v=fn3KWM1kuAw>